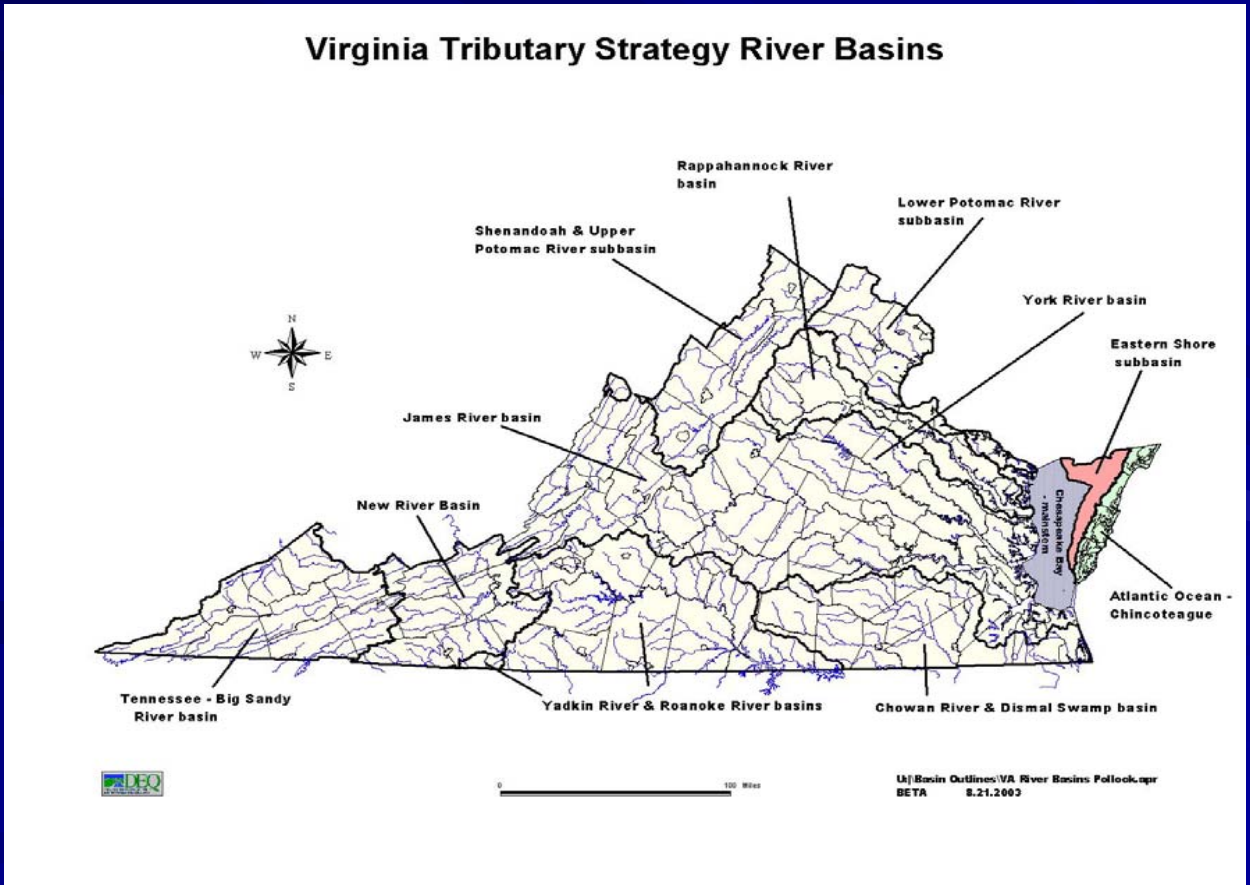
Mercury Advisory Committee Meeting
September 30, 2005

Elevated Mercury Levels in Fish Collected from Undeveloped Ponds and Swamps in Eastern Virginia

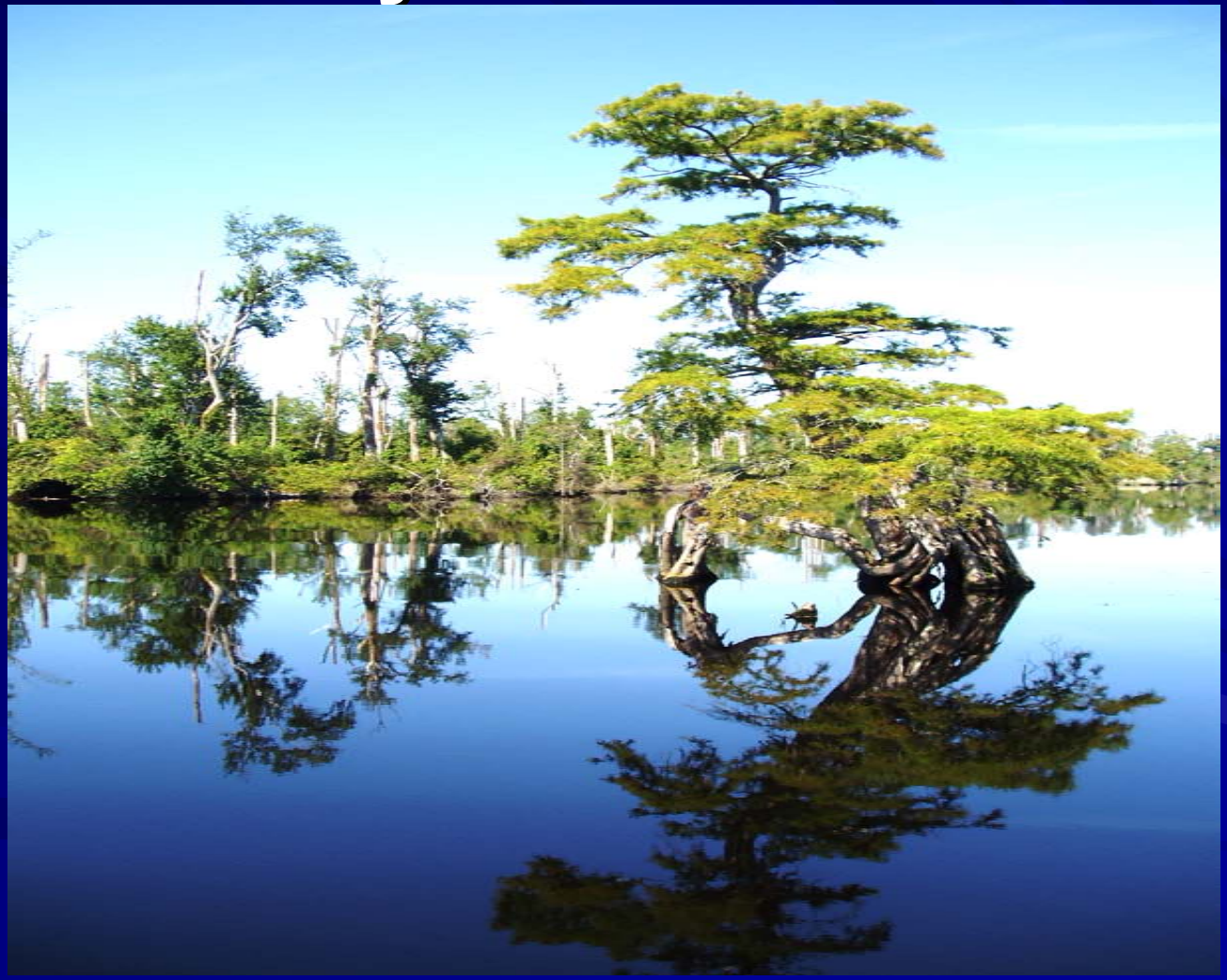
Goal of Clean Water Act : all Waters Should be “Fishable and Swimable”

Fish Monitored in 80-100 Sites/year; Cycling Through All Major River Basins in State Every 3- 5 Years



Fish are Analyzed for Toxic Pollutants Including Metals, PCBs, and Pesticides

Emerging Issue; "Mercury Sensitive" Waters



Increasing Interest Nationwide in Mercury in Recent Years

- Mercury typically seen in fish tissue
- Across the U.S., many fish consumption advisories are due to mercury

Mercury is a Special Pollutant

- Persistent in the environment
- Transformed into several different chemical forms
- Methylmercury accumulates in fish

Only Two Known Instances of Industrial Mercury Pollution in Virginia.

Occurred decades ago.

In 2001 the Level of Concern for Mercury in Fish Tissue was Lowered From 1.0 ppm to 0.5 ppm

DEQ Reviewed Virginia Mercury-Fish Data from 1995-1999

Only 5 of 565 samples >0.5 Hg ppm (0.8 %)

The Fish Monitoring Program Had always Targeted Industrialized Areas. The "Worst" Waters had been Monitored.

Can We Relax?

However; Fewer "Undisturbed" Waterbodies Had Been Monitored

This is a Logical Plan for Detecting Most Industrial Pollutants From Point Sources

Mercury is Different:

Mercury Cycle in Environment is Complex

Several forms of mercury exists in the environment

Methylmercury is the Important Form

Some bacteria found in soils and sediments can convert mercury into methylmercury

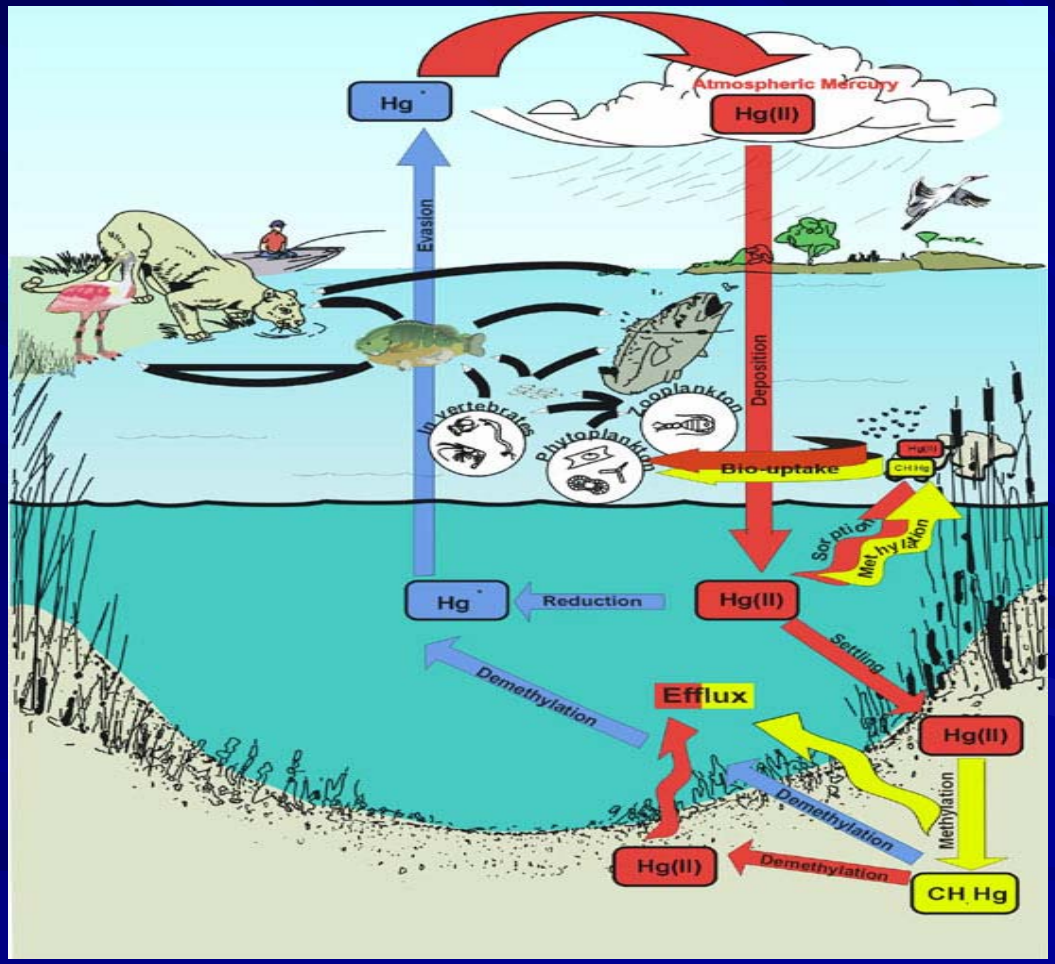
Certain environmental conditions favor the formation of methylmercury

Methylmercury is the form of mercury that bioaccumulates in fish

It is also the most toxic form of mercury

The Key to Mercury Contamination in Fish Lies with Mercury Methylation

MethylImercury is Produced in the Natural Environment as part of the Mercury Cycle



Environmental Conditions That Favor Production of Methylmercury

- acidic waters (low pH)
- high levels of organic material
- low levels of dissolved oxygen

Wetlands and Lakes are More Sensitive to Mercury

Environmental Conditions in Uplands are Less Sensitive to Mercury

Elevated Levels of Mercury in Fish Have Been Seen in Many Places Where There are no Obvious Sources of Mercury

Mercury Problems Seen:

Scandinavia

Canada

Minnesota

Wisconsin

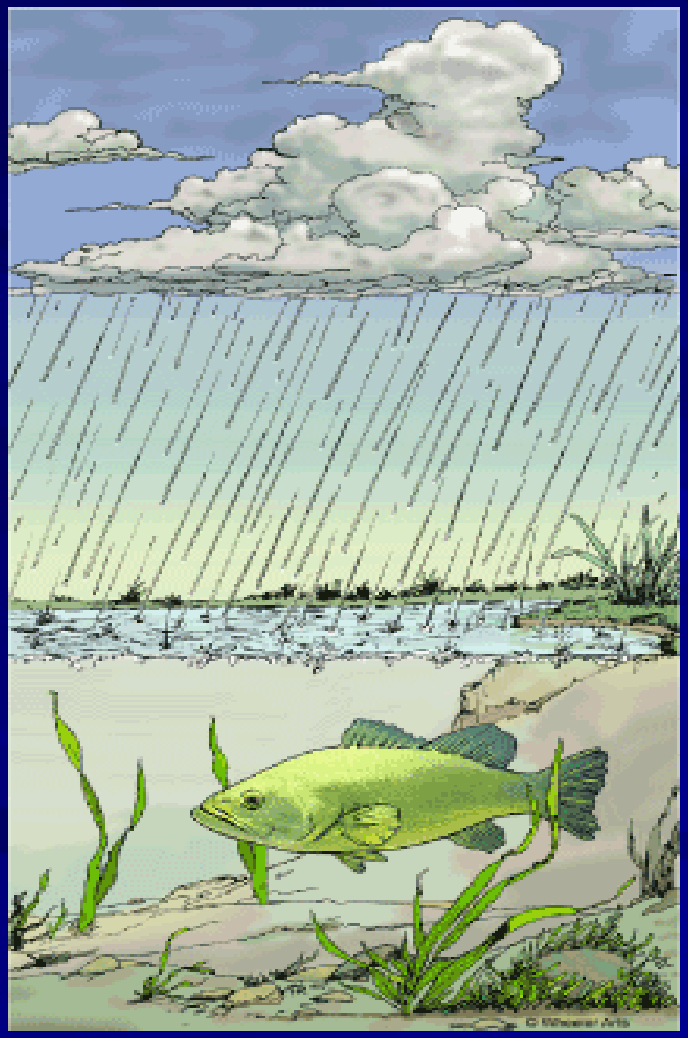
New England

Florida

North Carolina

Maryland

In Non Industrialized Watersheds



Air Deposition of Mercury and is Suspected Source of Mercury-Fish Contamination in Many of these Areas

Time to Change Directions.

In 2002 DEQ Monitored Rivers in Southeastern Virginia

Expanded to Include Areas with Relatively Little Human Impact

As a Result of 2002 Sampling,

Three New Fish Consumption Advisories Issued by Virginia Department of Health in 2003 for Mercury

Can We Relax Now?

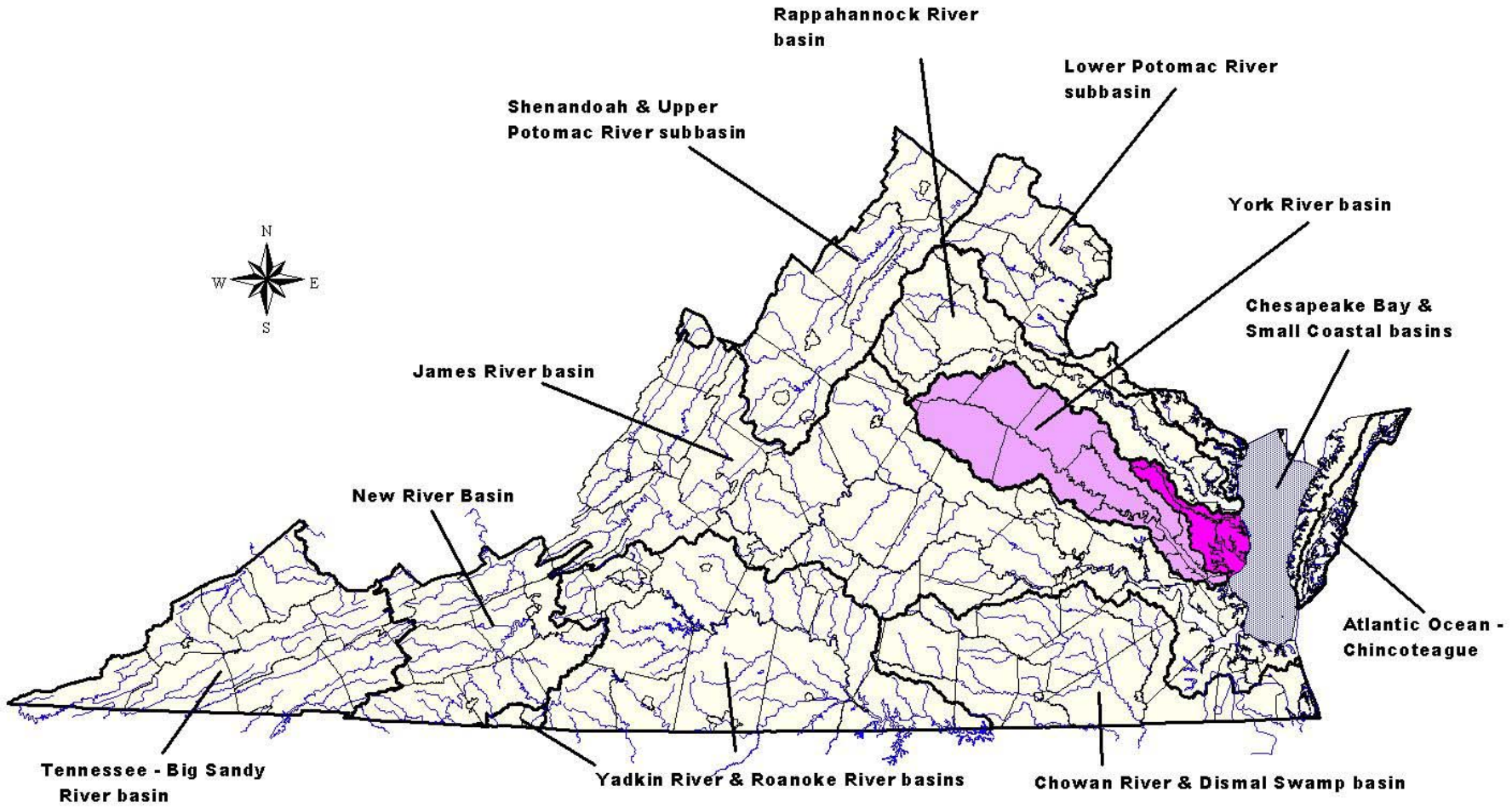
No. We Can’t Relax!

In 2003 DEQ Monitored Additional Ponds and "Swampy" Rivers

York River Basin Includes Many Rivers Influenced by Wetlands

Monitored in 2003

Virginia Tributary Strategy River Basins



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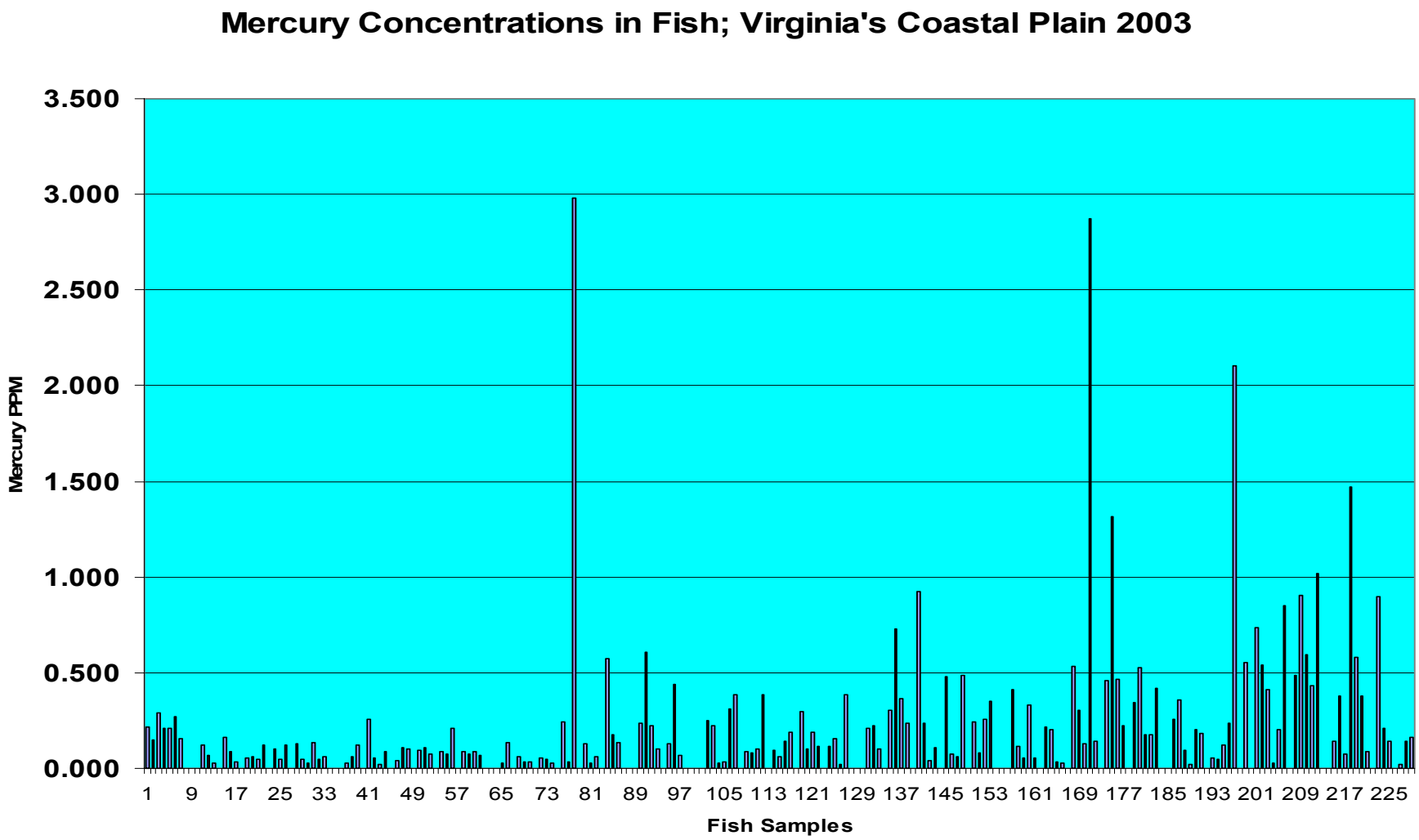
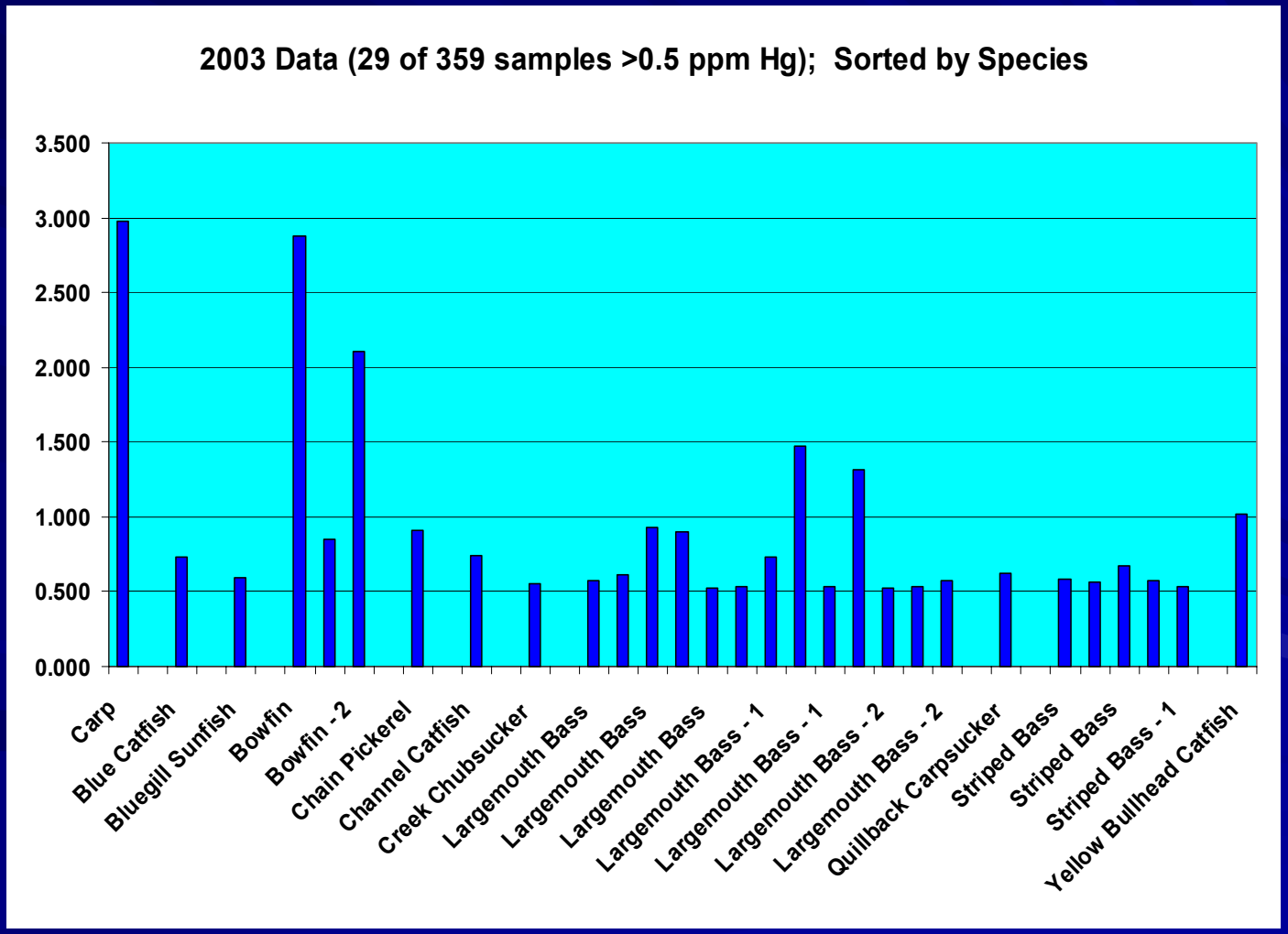
Mercury-Fish Concentrations Highly Variable



Most Fish Samples in 2003 >0.5 ppm Mercury Were Top Predators



Large Mouth Bass & Chain Pickerel

Bowfin

Some of These 2003 Sites Yielded Fish Samples Above 0.50 ppm Mercury

6 Advisories Issued in September 2004:

2 urban lakes

1 rural lake

3 rivers with wetlands

New Mercury-Fish Consumption Advisories in 2004

- Pamunkey River
- Mattaponi River
- Herring Creek

- Lake Gordonsville
- Lake Trashmore
- Lake Whitehurst

In 2004 DEQ did Extensive Sampling in the Three Waterbodies With New Fish Consumption Advisories

1. Blackwater River (8 sites)

2. Dragon Run Swamp-Piankatank River (7 sites)

3. Great Dismal Swamp (8 sites)

Figure 4. Blackwater River VEERF Stations (1 inch = 3.9 miles)

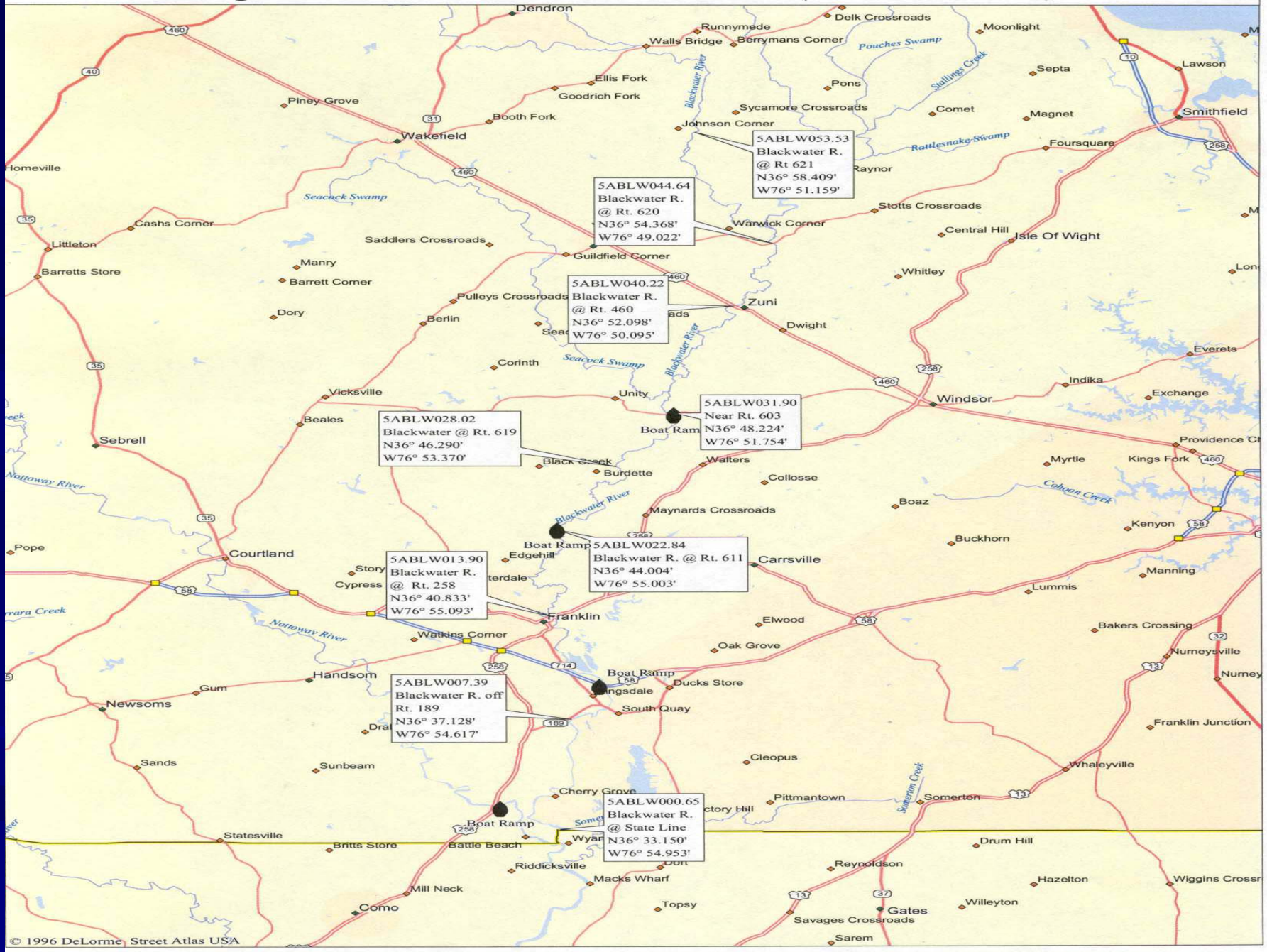


Figure 8. Dragon Swamp VEERF Stations (1 inch = 3.9 miles)

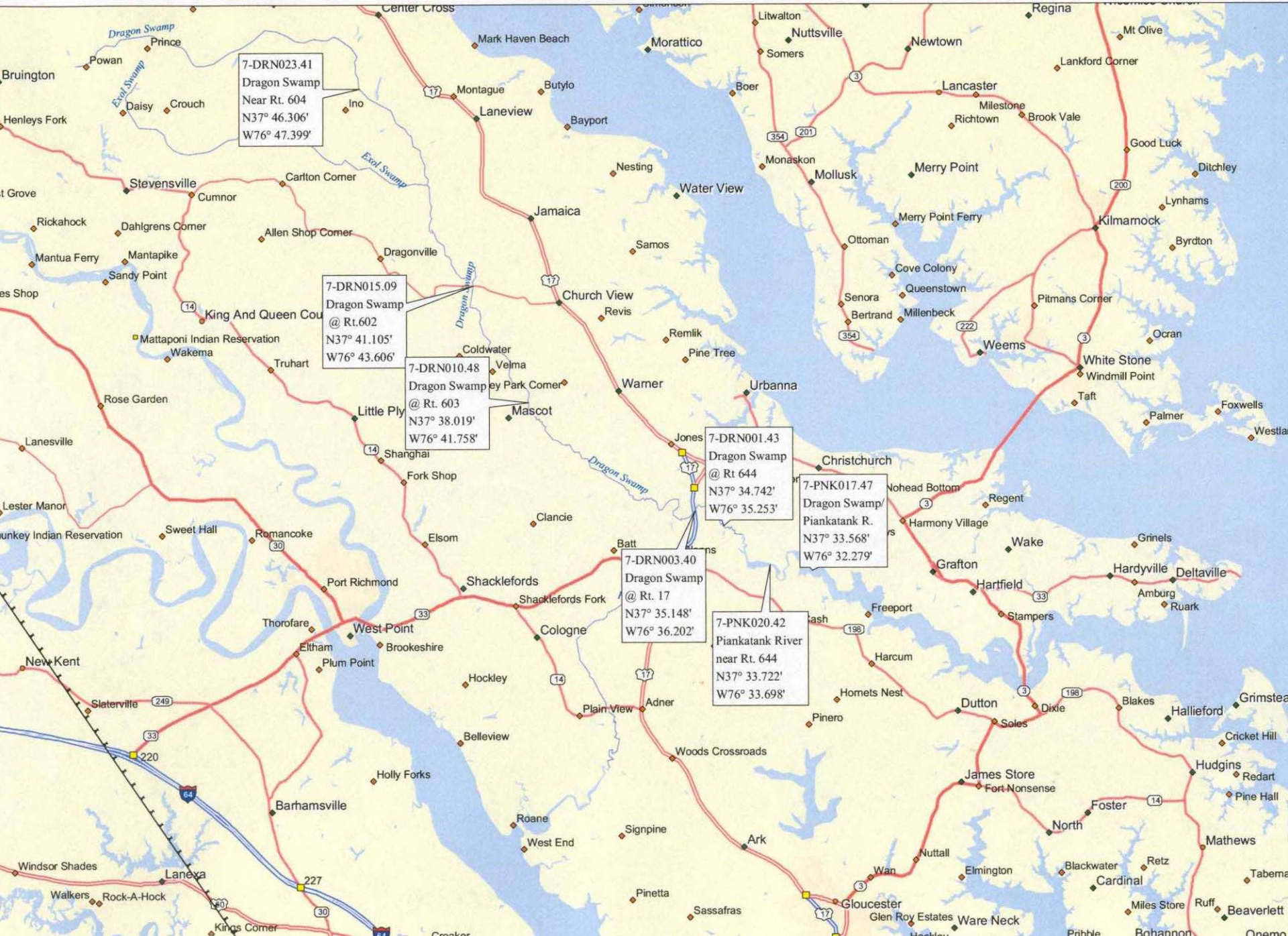
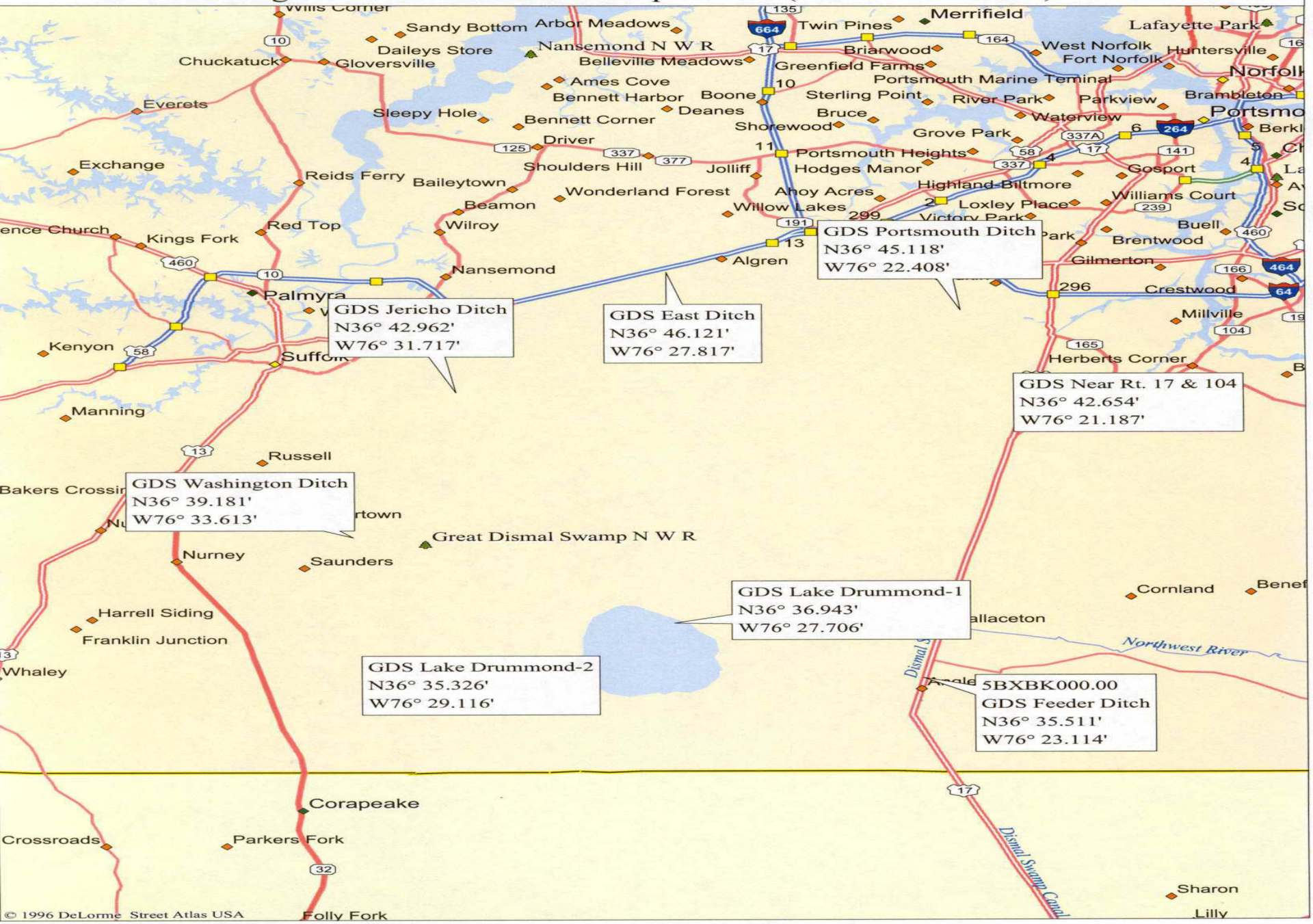
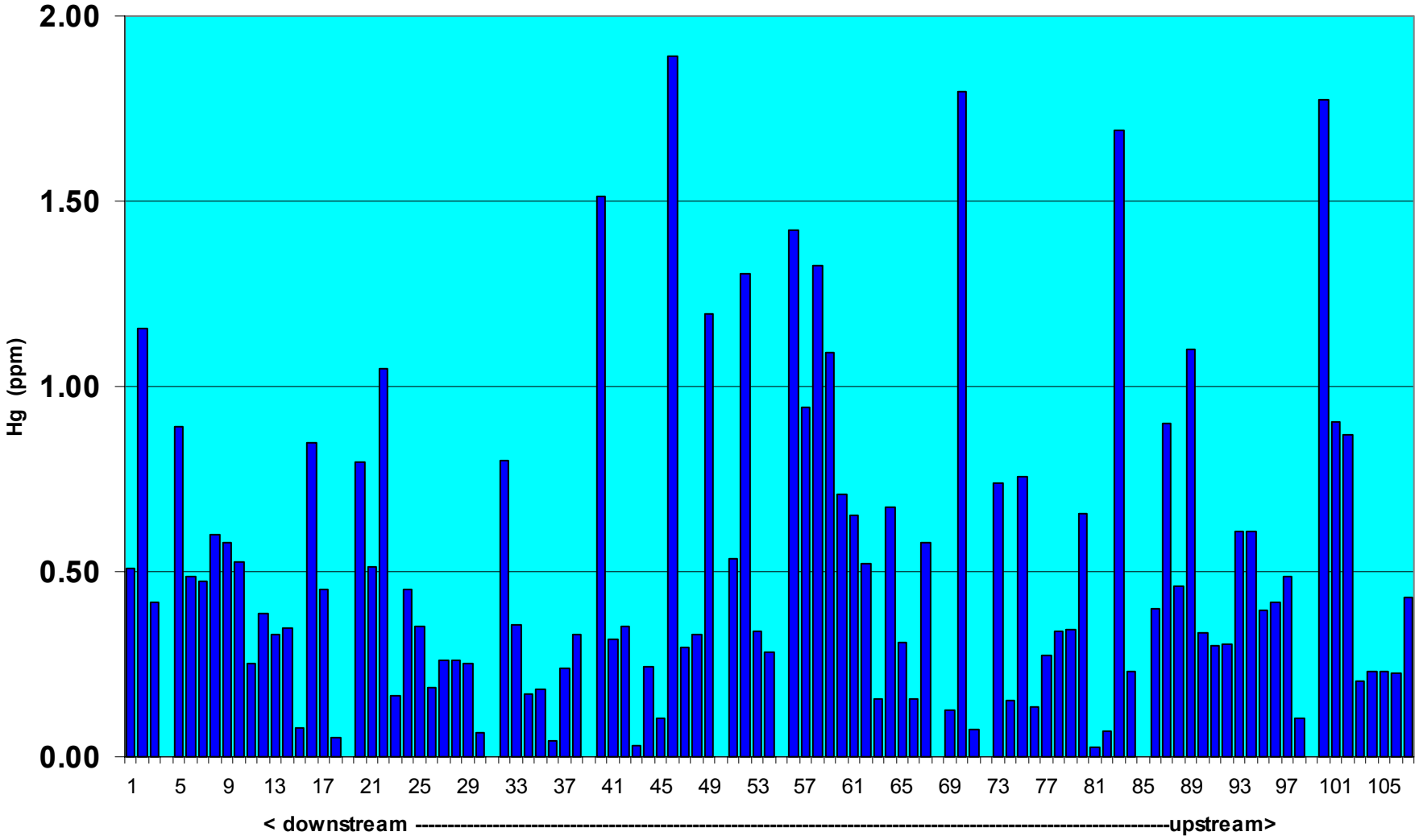


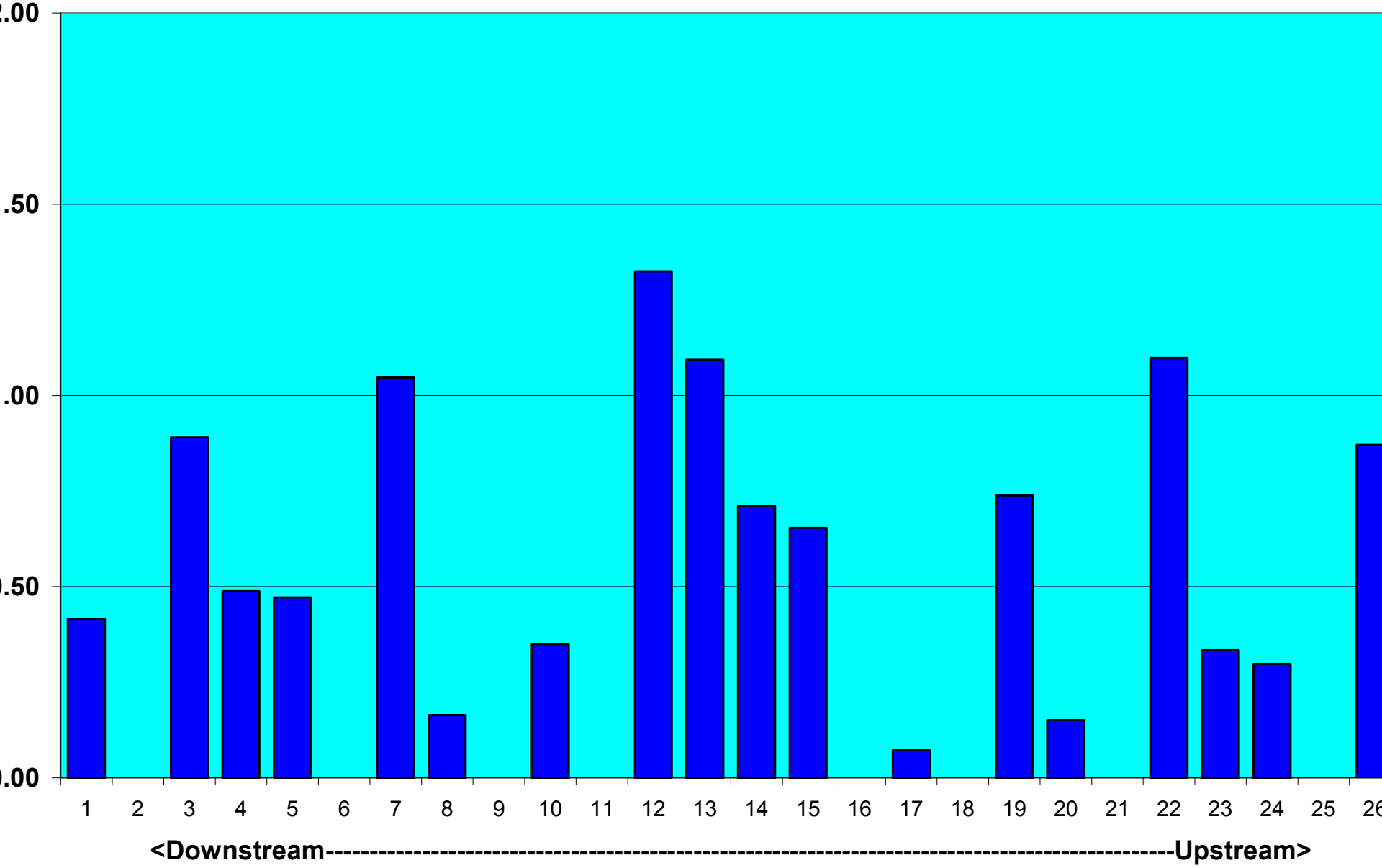
Figure 5. Great Dismal Swamp VEERF(1 inch = 2.8 miles)



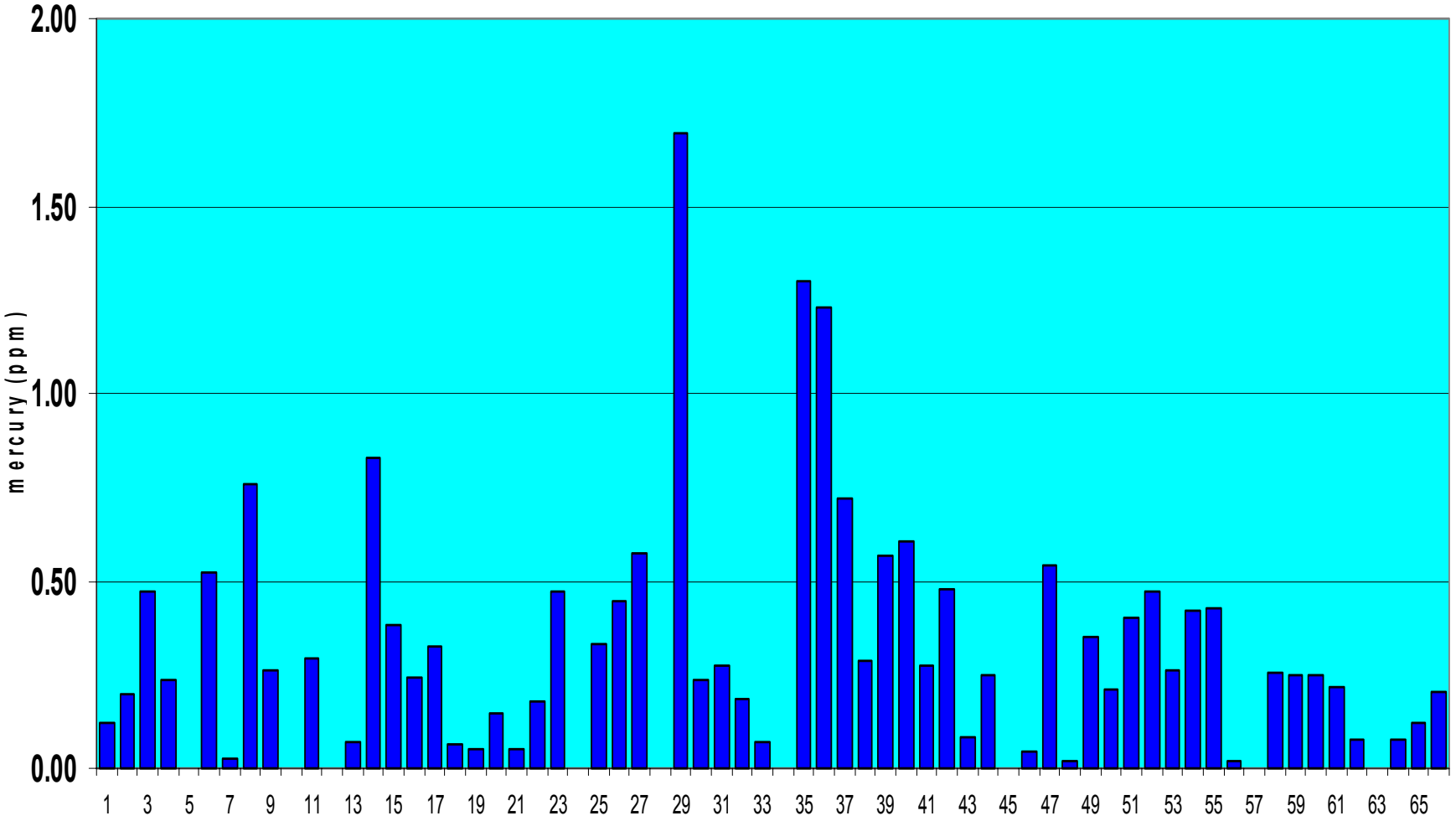
Mercury in Fish from Blackwater River 2004



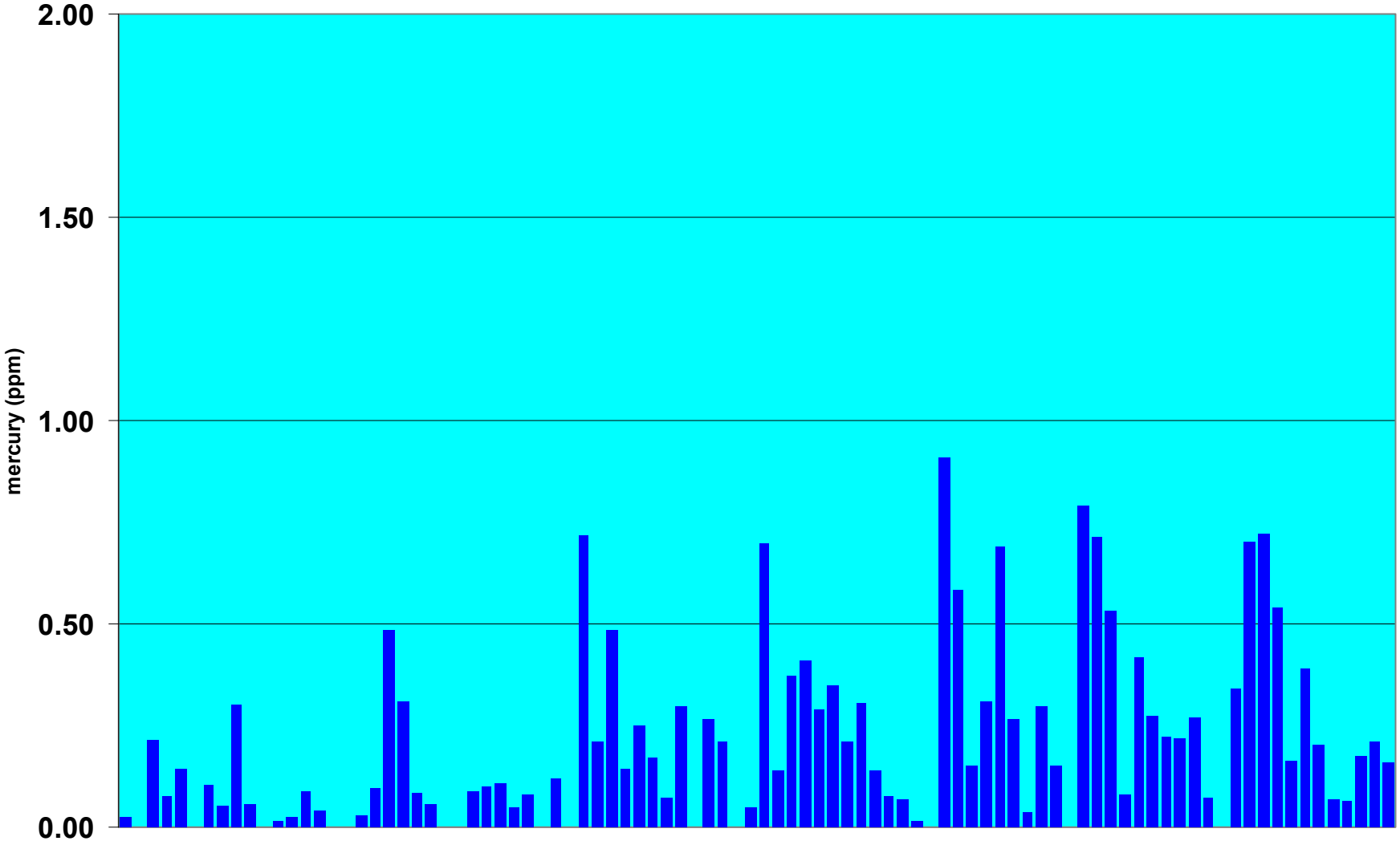
Blackwater River 2004: Mercury in Largemouth Bass



Dismal Swamp: 2004 Mercury in Fish



Piankatank-Dragon Run : 2004 Mercury in Fish



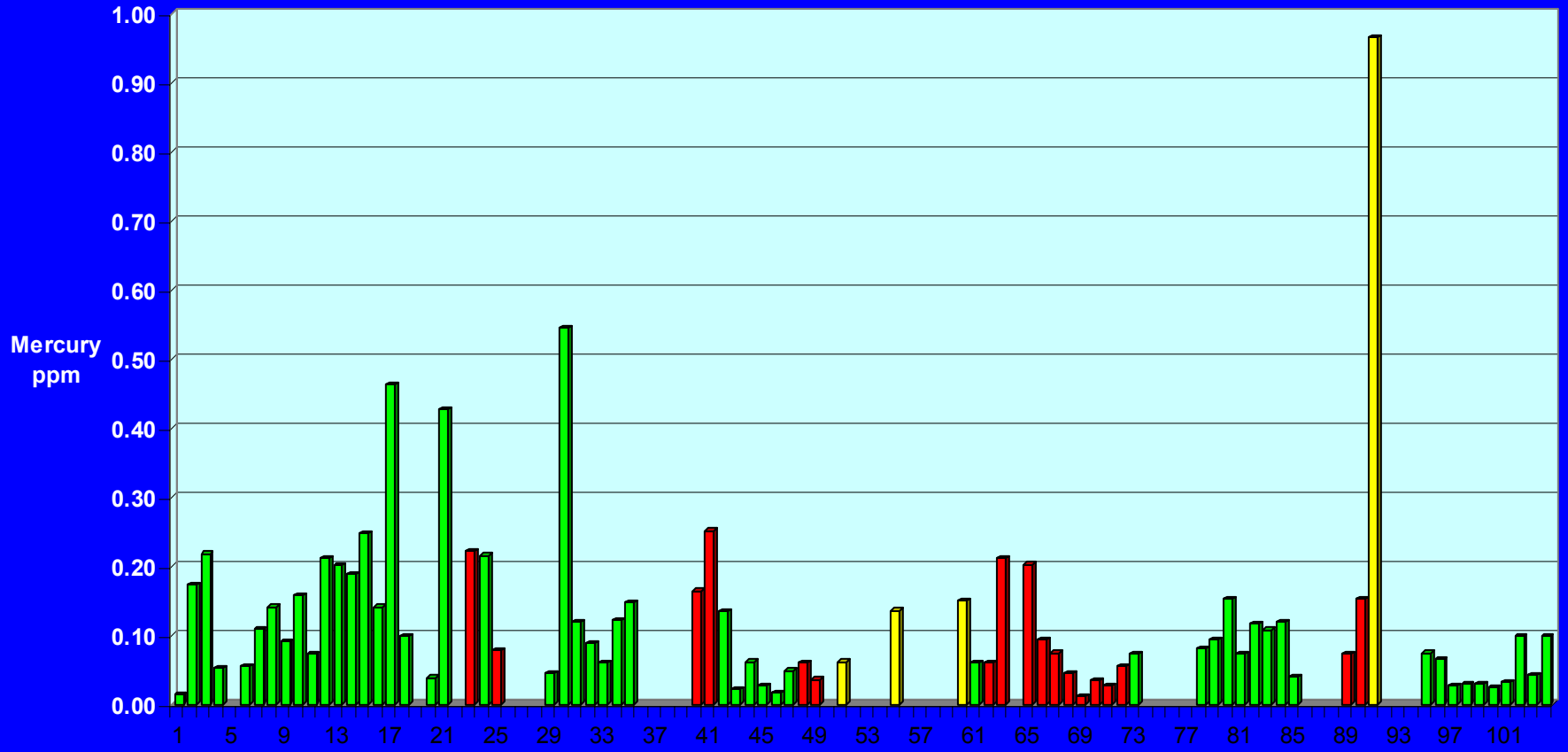
Sediment Mercury Levels Show No Obvious Correlation to Fish Concentrations

- Levels of mercury in sediment within the Blackwater, Dragon Run and the Dismal Swamp are within the low to mean range for the state

Mercury in Sediment 2003

Range <0.01 - 0.96 ppm Mean = 0.12

(Corresponding Fish Concentrations at sites: green =<0.3, yellow = > 0.3-<0.5, red = >0.5 ppm)



Sediment –Mercury Concentrations

Location	Range	Mean
Virginia-wide 1995-2002	<0.01 – 23.0	0.28
Virginia-wide 2003	<0.01 – 0.96	0.12
Dismal Swamp	0.041 – 0.13	0.10
Dragon Run	0.014 – 0.15	0.06
Blackwater	0.013 – 0.17	0.09
N. F. Holston	0.17 – 2.90	1.09
South River-Shenandoah	0.09 – 1.1	0.60

Search for a Source: Usual Sources of Mercury in the Environment

- Chlor-alkali plants (chlorine production)
- Mining: mercury or gold
- metals recycling
- atmospheric deposition from combustion (coal fired plants, municipal waste incineration , medical waste)

No Obvious Source of Mercury in Most of These Watersheds

- Environmental conditions in swamps and blackwater streams are known to promote formation of methylmercury
- Atmospheric deposition is a possible low level source of mercury

What is Being Done? 1

A. Virginia Department of Health has issued new fish consumption advisories due to mercury for nine waterbodies in 2003 and 2004.

B. Earlier consumption advisories were adjusted slightly in 2005 based on 2004 data.

What is Being Done? 2

In 2005, expanded fish sampling along approximately 80 miles of the Chickahominy River and other sites in the James River basin.

Data due spring 2006.

What is Being Done? 3

- Source identification investigation being conducted in the Dragon Run watershed.

What is Being Done?
4

DEQ working with the U.S. Fish and Wildlife Service in the Great Dismal Swamp to aid in assessing potential risk to wildlife in the Refuge.

What is Being Done ?
5

Mercury Advisory Committee Formed:

- State and Federal Agencies
- Universities
- Environmental Groups
- Industry

Three Issues to be Addressed by Mercury Advisory Committee

1. Provide advice for DEQ investigation of potential land-based sources of mercury in the watersheds

Three Issues to be Addressed by Mercury Advisory Committee

2. Provide advice on potential for air-born mercury to be a source of the mercury in these watersheds

Three Issues to be Addressed by Mercury Advisory Committee

3. Assist in developing a plan to address the related source assessment and remediation issues

Where Are We Going Now?

DEQ Conducted 2005 Fish Tissue Monitoring in Other Water Bodies With Potential for Increased Methymercury Production

Virginia DEQ Working with U.S. Fish and Wildlife In Great Dismal Swamp National Wildlife Refuge

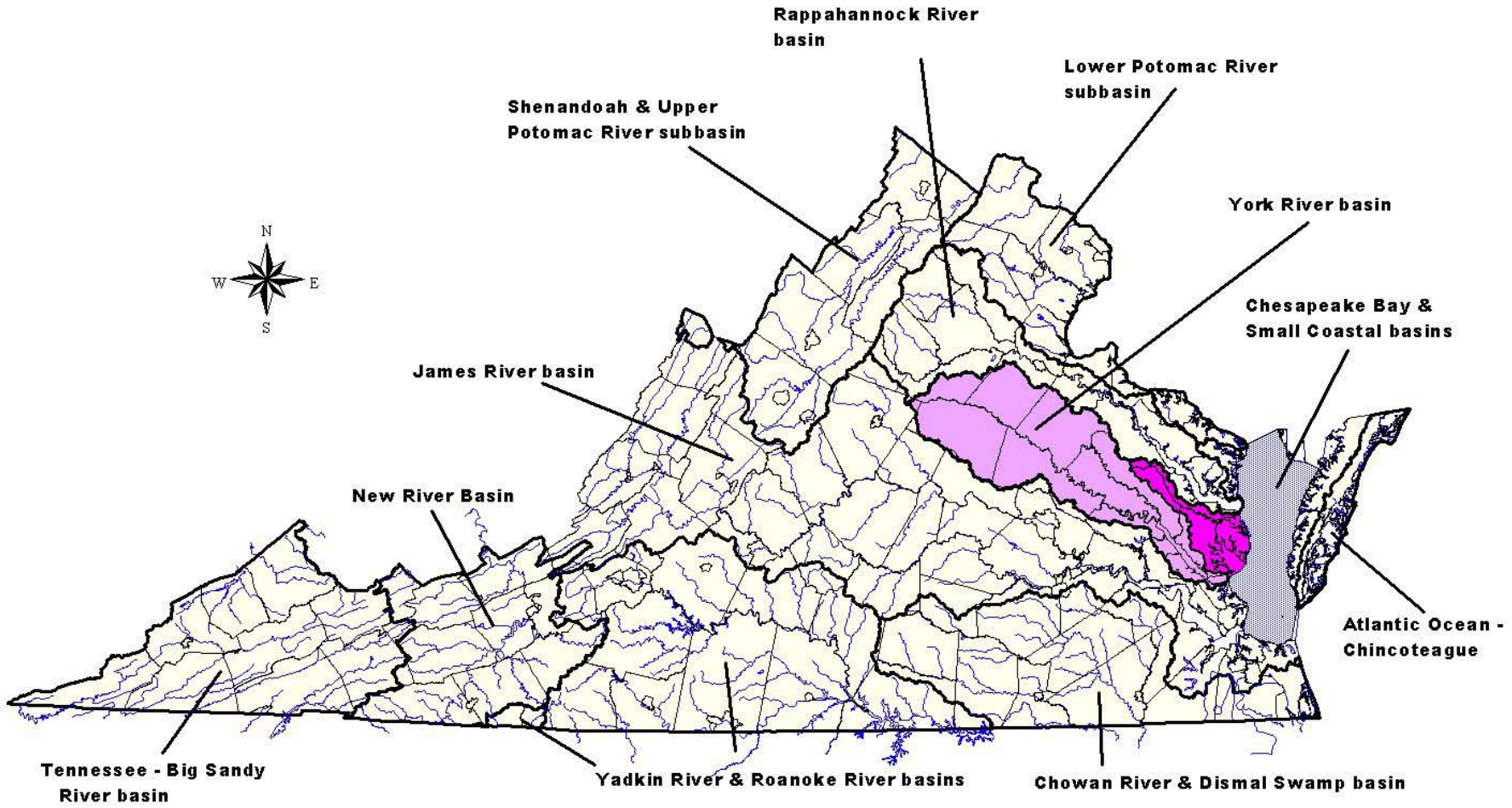
Plans for Monitoring in 2006 and beyond:

1. Possible need for additional monitoring in the headwaters of the Blackwater River.

2. Additional sites for 2006 monitoring?

3. Plan to continue to monitor all these affected waterbodies on a continuing basis through the rotating monitoring plan.

Virginia Tributary Strategy River Basins



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